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# Environmental turbulence: impact on UK SMEs' manufacturing priorities

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## Abstract

**Purpose:** This paper aims to assess the impact of 2008 recession (Great Recession)-led environmental turbulence on the manufacturing small and medium enterprise (SME) sector and its related competitive priorities.

**Design/methodology/approach:** A mixed methods research strategy, consisting of a survey of 104 manufacturing SMEs located in the UK, complemented by 17 in-depth interviews with senior management representatives from this survey group.

**Findings:** Senior managers have prompted a realignment of competitive manufacturing priorities accounting for external financial and market conditions. Differing competitive priorities post-recession are given to various areas of manufacturing decision-making, the greatest impact being on manufacturing costs. Manufacturing flexibility, performance in meeting customer deliveries and enhancing supplier selection are merited to increase priority with relatively little change for process technology, quality and environmental practices.

**Research limitations/implications:** The sample of survey participants was relatively small, therefore prohibiting an assessment of differences in competitive priorities by sub-sectors of manufacturing SMEs. This was offset by a healthy number of informative, in-depth interviews that provided a richness of examples and insight into the shifting priorities for the sector.

**Practical implications:** Clear priorities have emerged around reducing manufacturing costs, being more flexible in manufacturing and improving outward performance relating to customers and suppliers.

**Originality/value:** This builds on established manufacturing strategy constructs and points to necessary competitive priority realignment focused on the performance areas listed above.

**Keywords:** Environmental turbulence - Great recession - Manufacturing priorities - Mixed-methods research - UK manufacturing SMEs

## Introduction

Manufacturing is crucial to and makes a highly value-added contribution to the UK economy. This includes over 10 per cent of the country's gross domestic product (GDP), 2.5 million jobs and 46 per cent of UK exports (Rhodes, 2014). UK manufacturing is ranked seventh in terms of global output, contributing 3 per cent of global manufacture (UNCTAD, 2014). Despite length and severity, the 2008 recession-led economic turbulence and its impact on manufacturing small and medium enterprises (SMEs) have enjoyed limited academic attention (Price *et al.*, 2013). Studies on recessionary impact on SMEs are typically focused on organisational survival and in particular on SMEs' access to finance and developments in markets and products (Kitching *et al.*, 2009a, 2009b; Smallbone *et al.*, 2012).

This study aims to complement the extant literature by evaluating how SMEs within the UK manufacturing sector have redefined and reconfigured their competitive priorities as a result of the environmental turbulence caused by the 2008 recession.

The 2008-2009 recession has been the longest and the deepest when compared with a number of earlier economic global downturns since the 1920s and is now termed the “*Great Recession*”. The effects of the Great Recession and subsequent contraction of the British and global economy have exhibited complexity and contradiction. Changes in unemployment and output have been relatively small; nevertheless, UK businesses are behaving very differently in terms of casting jobs when compared historically (ONS, 2012a). The recessionary period has been very tough for SMEs and continues to be so, where lack of resources has meant being inhibited in identifying and responding to certain economic trends and movements (Kitching *et al.*, 2009a). Equally, radical diversification is difficult in the SMEs sector, as there is greater focus on narrower customer bases (Smallbone *et al.*, 2012). Changes have consequently taken place within SMEs, particularly with internal operations. This study adds to SMEs-related research by reporting on the strategic issues facing UK-based manufacturing SMEs (MSMEs), contextualising on MSMEs manufacturing competitive priorities as recorded by the recessionary experience of their associated senior managers. An SME is defined as an organisation employing up to 250 people on a full-time equivalent basis and not exceeding £25 (€33) million turnover (European Commission, 2005; Great Britain, *Companies Act 2006*, s. 382 and 465). This study has a specific focus on those SMEs involved in the broad range of manufacturing practices defined by the physical or chemical transformation of materials, substances or components into new products (ONS, 2007), rather than providing service activities (for example retail, transport, distribution and accommodation and food).

The research question driving this particular enquiry is:

*RQ1.* How has the environmental turbulence driven by the Great Recession redefined the manufacturing competitive priorities of the UK MSMEs sector?

Manufacturing priorities are a set of strategic objectives the manufacturing function is expected to meet in order to support the firm's overarching corporate strategy (Sarmiento *et al.*, 2008). Within the literature, the list of manufacturing priorities has expanded considerably over the years into a relatively diverse and not always in consensus set of competences. The most commonly accepted manufacturing priorities highlighted in the literature which also inform the focus for this particular study are manufacturing cost, delivery performance, quality, manufacturing flexibility (Ward *et al.*, 1996), product range, supply chain management (Hill, 2009), process technology (Hayes *et al.*, 2005) and the growing importance of manufacturing environmental practices (Deif, 2011).

To determine the extent to which these chosen areas of manufacturing priority have been redefined in the post-recession business environment, primary data have been collected by means of a mixed methods research approach, which are subsequently analysed and herewith assessed in relation to relevant literature. The contribution of the present paper is the development of a conceptual and practice-leading framework illustrating the recessionary impact of various business environment factors on the MSMEs' manufacturing priorities and which counter-recession strategies apply to the sector.

## Theoretical background

### *Environmental turbulence – definition and characteristics*

The survival and growth of organisations are subject to a composite of a macroeconomic sector and market dynamics that are highly fluid and have significant influence on the business environment. There is consensus that organisational survival is very much dependent on the response and adaptation of organisations as a consequence. Of particular interest to this paper is the SME-focused research by Kitching *et al.* (2009a, 2009b), Price *et al.* (2013) and Soininen *et al.* (2012) who extended the earlier seminal inquiry by Ward *et al.* (1996) on the impact of environment turbulence on business strategy.

The “business environment” incorporates the following three dimensions:

- (1) “*Environmental turbulence*”, defined by rates of industrial innovation alongside the unpredictability of the competition and market direction (Kipley *et al.*, 2012).
- (2) “*Environmental hostility*”, defined by levels of threat as a result of complex, intense and volatile competition and supply chain to the organisation (Zahra *et al.*, 2000).
- (3) “*Environmental heterogeneity*”, defined by market diversity and the resultant variation in manufacturing and marketing strategies developed in response (Porter, 1980).

Furthermore, “business cycle” denotes the national and transnational economic volatility. An “economic recession” is defined as the economic period where national GDP performance declines over two consecutive financial quarters (Vaitilingam, 2009). The study presented here focuses on the Great Recession, which arrived after a steady GDP growth in the UK economy from 1992 to 2008 with an extended and deep recession period 2008 to 2009.

The characteristic “economic recession” represents a component of “environmental turbulence”, the latter exhibiting one or more of forthcoming shortage of capital (Street *et al.*, 2011), market share shrinkage with international competitors providing alternatives (Cameron *et al.*, 1988), sector fluidity and hostility to structure (Covin and Slevin, 1989; Kipley *et al.*, 2012).

### *Small and medium enterprises strategic response to environmental turbulence*

Organisational response to environmental turbulence and volatility requires a re-alignment of competitive priorities (Stonebraker and Liao, 2004). Ward *et al.* (1996) suggest a relationship exists between organisational structure and strategy, manufacturing priorities and the external business environment, with manufacturing priorities occupying a middle position and being subject to influence both internally and externally. Manufacturing priorities combine both “adaptive” and “rational” dimensions which are driven by the turbulence or calm of the prevailing business environment (Papke-Shields *et al.*, 2006). The associated dimensions may aim for adaptation to economic and market constraints or exploration of product innovation opportunities (Smallbone *et al.*, 2012). Within the SMEs arena, Kitching *et al.* (2009a, 2009b) recognised three organisational clusters of a recessionary-coping strategy:

- (1) “*severe shock*” involving radical cost cutting and enhanced customer focus through greater customer engagement;
- (2) “*limited impact*” with aggressive selling and market-development strategy; and
- (3) “*no perceived impact*”, with consolidation achieved by protecting market share and range of products.

Recent research supports the above three clusters with empirical data suggesting that SMEs which during the global Great Recession were proactive in innovation, business attitude and behaviour performed more robustly than their risk-taking counterparts (Soininen *et al.*, 2012). Moreover, innovation as a counter-recession strategy promotes utilisation of existing strategic capabilities and leads to manufacturing efficiencies, while risk-taking initiatives may require external funding, a potentially scarcity given the external backdrop. These constructs agree with the earlier study by Covin and Slevin (1989) on US-located MSMEs operating in “hostile” business environments, who report that high business performance is supported by a business structure characterised by accessible and responsive management systems and driven by a strategy that encompasses proactive, innovative and risk-taking initiatives.

Research on the early-1990s UK recession identified evidence of a severe costs manufacturing strategy (Kitching *et al.*, 2009a, 2009b) with a reduction of human resources and production capacity (Geroski and Walters, 1995), although product portfolios remained relatively consistent pre- and post-recession. Changes in financial budgets exhibited some variation, with contraction in manufacturing process investment, and contrasting with budget maintenance for innovation and marketing, although patent application data in this period point to product development decline (Geroski and Walters, 1995).

In contrast, UK organisations have responded differently to the Great Recession of 2008-2009 and subsequent environmental turbulence in terms of employment levels. The Office for National Statistics (ONS, 2012a) and the Chartered Institute of Personnel and Development (CIPD Outlook, 2012) point to manufacturers maintaining staffing levels aiming to preserve skills and knowledge (Price *et al.*, 2013), although this impacts negatively on productivity, given the decline in market demand. This maintenance has arguably been assisted by the accumulation of high financial surpluses leading up to the recession and high costs associated with redundancy and any subsequent rehiring and development of future employees (ONS, 2012a). Product innovation has also received significant investment within counter-recession strategies (MacBryde *et al.*, 2013), this being at odds with organisation decision-making during the early-1990s (Geroski and Walters, 1995).

With the consideration of UK SMEs, Kitching *et al.* (2009a, 2009b) identified increased investment in product development as a means to combat the Great Recession. There is further acknowledgement in these studies of a simultaneous pursuit of both revenue-generating and cost-cutting initiatives, substantiating other researchers (Rumelt, 2009; Williamson and Zeng, 2009) with such actions being defined as “ambidextrous strategy”. Ambidextrous strategy appears to take on two potential directions, the first centred on organisational development and subsequently management of a manufacturing capability (Sanchez, 1995) and the second providing defence in response to external crises while realising opportunities (Grewal and Tansuhaj, 2001). We can argue that ambidextrous strategy requires a degree of

organisational flexibility and therefore a necessity for change. Thus, ambidextrous strategy entails a degree of complexity resulting from its long-term business planning condition (Geroski and Gregg, 1994). There are also short-term implications, particularly in times of economic recession, resulting in resource flexibility and providing business response to market decline. Such organisational attribute is known within the supply chain literature “agility” (Sukwadi *et al.*, 2013).

### *Re-aligning manufacturing priorities in small and medium enterprises*

In response to the strategic adjustments described above, manufacturing organisations have re-prioritised a number of related areas in their decision-making process. Manufacturing priorities have typically been defined as manufacturing cost and flexibility, quality and delivery performance (Tarigan, 2005; Rusjan, 2006). There appears to be less agreement in the research community on the ranking of these manufacturing priorities (Rytter *et al.*, 2007; Kiridena *et al.*, 2009). These critics point to wide variation in manufacturing strategy formulation, a process that encompasses complexity, dynamism and continuity of dialogue and multiple of determinants internal and external to the organisation.

While the literature provides numerous examples of the setting of manufacturing priorities, it appears to be limited with specific consideration of MSMEs (O'Regan *et al.*, 2006). Examples of studies that do consider this arena include that of Lagace and Bourgault (2001) from a Canadian perspective. Manufacturing priorities in this location centre on quality, flexibility and employee engagement, with relatively less focus on product development configuration, plant issues pertaining to set-up times, layout and maintenance, as well as externally around supplier relationships. Critical to the outcome of this study is that manufacturing priorities are to a great extent individual MSME-centric.

Manufacturing cost has traditionally ranked highly as a priority within manufacturing strategy. Costs primarily comprise materials outlay, estimated by Hill (2009) to range between 70 and 90 per cent. Cost efficiencies can be achieved through enhancements in other areas of manufacturing, in particular productivity and supply chain proximity (Melnik *et al.*, 2010). Investments must be treated cautiously and be in-line with the overarching business strategy (Raymond and Croteau, 2009), given the recognition to previous periods of economic challenge resulting in wide-scale MSME investment in quality systems (e.g. JIT and TQM) without short-term benefits in performance improvement (Boyer, 1998).

To meet the ongoing agenda of quality management, manufacturing organisations have invested in the development of robust cross-functional relationships between product design, manufacturing and marketing, termed *concurrent engineering* (Schroeder *et al.*, 2011). These relationships have also moved externally to encompass suppliers (Handfield and Lawson, 2007), with supply chain partnerships becoming in recent times ever more crucial as concurrent engineering becomes established (Kim and Wagner, 2012; MacBryde *et al.*, 2013).

Where organisations are positioned in a business-to-business marketplace, there is growing priority attached to supply chain management. This is particularly important in a marketplace filled with customers possessing growing knowledge of prices and lead times. This has led to upturns in customer demands, further characterised by order variety and complexity (Harrison and van Hoek, 2011). These increased customer

expectations have reinforced the role of delivery performance, which is enhanced through reductions to product development and manufacturing lead-times, underpinned by quality and delivered by means of the increasingly prioritised concurrent engineering philosophy (Pullan *et al.*, 2010). The growing importance of collaboration within the supply chain extending to the relatively early point of product design is further identified by Kim and Wagner (2012), with supplier suitability being defined by a combination of proximity to mitigate against cost and logistics complexity, favourable lead-times, finance and technical capability (Sharma and Yu, 2013).

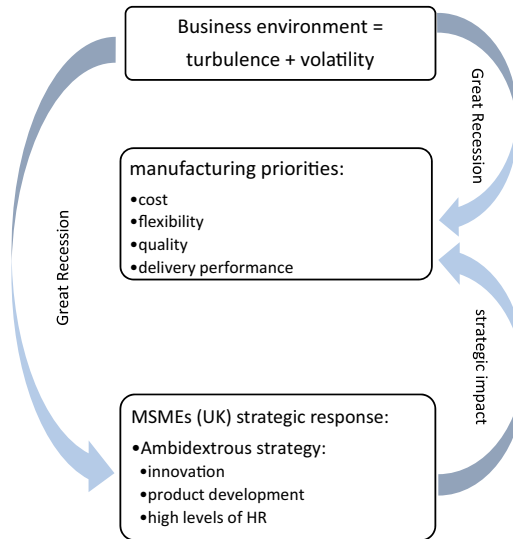
Innovation has an established role in SME product and service development as a precursor to organisational growth (Beaver and Prince, 2002), with “order winners” being key benefactors where product innovation represents an organisational strength (Hill, 2009). From a UK perspective, the transformation of R&D investment to product realisation is particularly challenging across the MSME sector, with greater priorities typically afforded to sales and marketing strategies at the expense of manufacturing processes within high-growth MSMEs to gain competitiveness on customer service and price (O'Regan *et al.*, 2006). The importance of flexibility around customer demands for SMEs is further recognised by Hogg (2003), as is its contribution to increased competitive advantage for organisations operating within a turbulent business environment (Oke, 2005). More recently, the importance of price has diminished and has been superseded by quality and customer service as priority and value-added activities (MacBryde *et al.*, 2013). Product flexibility, referred to by Hill (2009) as an “*order qualifier*”, is becoming a greater requirement for MSMEs with a significant export agenda (Rundh, 2011), these findings collectively pointing to the strategic importance of manufacturing flexibility.

The Department for Business Enterprise and Regulatory Reform of the UK endorses the implementation of processes that are both energy efficient and waste reducing which, in turn, will support reductions in the organisations' costs (BERR, 2008). The positive link between environmental practice adoption within the context of manufacturing and enhanced organisational performance has been established by Deif (2011), with benefits realised across the four key competitive priorities listed above. Environmental initiatives have reached strategic objective status, with “environmental reporting” playing an increased role enhancing the potential for sustainable competitive advantage (Clarkson *et al.*, 2011).

Prior to the recent economic downturn, investment and growth represented key manufacturing strategic priorities in the UK, with HR investment being particularly visible, alongside market expansion in the UK and European Union, permitting new product development and entry into alternative geographical markets (DTI, 2008). Both of these trends have been vulnerable to the global economic surroundings, so in turn, these conditions have influenced manufacturing strategy, the SME sector included.

Figure 1 captures the key messages of the literature as reviewed within the above review. The developed theoretical construct makes use of the proposition by Ward *et al.* (1996) on the relationship between organisational strategy, manufacturing priorities and the external business environment and builds around it the theoretical contributions of extant studies on the recessionary impact on MSMEs, most notably of Kitching *et al.* (2009a, 2009b).

**Figure 1.**Theoretical construct



### Study design

Manufacturing strategy research has typically been mono-method in approach, most commonly involving quantitative assessments. Relatively few notable examples exist where mixed methods are implemented (Kitching *et al.*, 2009b; MacBryde *et al.*, 2013). A mixed methods research approach has been chosen specifically for this study, with the intention of combining both qualitative and quantitative data collection, analysis and interpretation (Creswell and Plano Clark, 2011). This approach seeks to counter any limitation of using one method, thereby seeking to provide a greater insight into the recession's impact on the MSMEs sector within the UK. The study also responds to requests for further qualitative-based research to be undertaken in manufacturing management (Boyer and Swink, 2008; Barratt *et al.*, 2011), through its inclusion of qualitative analysis as part of the mixed methods investigation.

The data collection instrument in the form of a questionnaire was common to both survey and interviews and was used sequentially (Creswell and Plano Clark, 2011), allowing the QUALitative data from the interviews to complement the QUANtitative data of the survey. The collected QUAL data set offered rich textual data that put into context the individual-company responses as indicated on a balanced six-point Likert scale within the QUAN data set. The used parallel mixed analysis dictated the interaction, influence and "discussion" between the two data sets (QUAN and QUAL)(Tashakkori and Teddlie, 1998). Greene *et al.* (1989) provide a useful five-dimensional conceptual framework on how individual QAUN and QUAL data sets can be combined or integrated, and the five dimensions are triangulation, complementarity, development, initiation and expansion. Within this study, the "development" dimension of design was applied. This takes place at the interpretation stage, with separate analysis stages for each QUAN and QUAL data set.



Potential research participants were identified through access to the Kompass UK Business Directory, which housed information for 2,183 MSMEs that were accompanied by named organisational contacts. Contact was made with the named senior managers who were appropriate to the study because of their potential familiarity with organisational strategy and associated decision-making. By means of an online survey instrument, 104 complete and usable questionnaires were returned, a response arguably in keeping with the method of questionnaire dissemination (Porter, 2004), which further compares positively with recent manufacturing studies regarding participant numbers (Li, 2000; Amoako-Gyampah, 2003; Anand and Ward, 2004). The demographic profile of respondents is presented as part of the papers' findings.

The survey participants were invited to take part in follow-up interviews, 17 accepted, contributing on average 45-min interview time. The interviews permitted a similar broad coverage of the MSMEs sector in terms of organisational size, sector, duration of business activity and turnover.

The survey instrument developed for this research contained a number of distinct areas of manufacturing consideration, two of which were on manufacturing priorities and different aspects of manufacturing costs, both presented in a balanced six-point Likert scale form ranging from "no impact" to "very high impact". The surveyed manufacturing priorities comprised the eight areas listed in the paper's objectives and are consistent with the assessment of the literature subsequently presented. As part of the development of the survey instrument, the researchers' University provided necessary ethical clearance; appropriate protocols were implemented for confidentiality, anonymity and data storage. The survey instruments were subject to piloting to ensure clarity of terminology, wording and instruction, further assessing completion time and participant understanding.

The QUAN data set was restricted to descriptive analysis comprising summary statistics, percentage frequency distributions and graphical presentation affording a sector overview, alongside a correlation analysis involving the scales relating to both manufacturing priorities and specific areas of cost. Forza (2002) recommends in the case of surveys with non-representative samples the use of preliminary data analysis which includes frequency distribution of variables. Likewise, Caracelli and Greene (1993) and Tashakkori and Teddlie (1998) suggest that where mixed methods apply, the quantitative data should be subject to descriptive statistics to explore frequencies of variables.

From the study outset, it was anticipated that the total number of questionnaires dispatched, coupled with the likely response rate, would yield a number of returned questionnaires, which compared against the associated numbers of MSMEs within the different manufacturing sub-sectors, would prohibit meaningful tests for differences in sector experience. This represents a study limitation albeit perhaps not unexpected for a sector noted for low study participation (Dennis, 2003). Similarly, difference by size band, level of turnover and company age is omitted for the same reason. This shortcoming is offset to a great extent by the detailed summary overview and correlation analysis coupled with the quality and volume of QUAL data generated by the time-rich and in-depth supporting interviews that followed the survey. With the latter in mind, template analysis (King, 2004) was implemented, and the combined analysis permitting appropriate linkage and synthesis between the two components of analysis (Yin, 2006) around the levels of recessionary impact indicated quantitatively, and the extent and range of MSMEs' manufacturing priorities adjustments articulated in qualitative form and pertaining to strategy changes, investments and other organisational interventions.

## **Study findings**

### *Participant overview*

The 104 participating organisations in the survey represent 4.8 per cent of those MSMEs targeted within the study and comprise:

- a total of 8 per cent employing fewer than 10 people (micro), 52 per cent employing 10-50 (small), 22 per cent employing 51-100 staff, 13 per cent employing 101-200 and 3 per cent employing 201-250 (all medium sized);
- typical levels of annual turnover ranging £0.5-£6.5m, accounting for 64 per cent of the sample, with a further 29 per cent achieving turnover in the range £6.5-£25m;
- for ownership, 65 per cent are independent and 35 per cent a subsidiary or an operating unit of a group of companies; and
- for business maturity, 71 have a business history of 20-30 years, 11 being over 100 years old, but only 22 having less than 20 years' experience.

In terms of manufacturing approach and primary sector:

- the majority operate under batch (53 per cent) or job (40 per cent) manufacturing types, with 27 per cent employing project manufacturing and 13 per cent a line process, various participants suggesting they deploy a combination of manufacturing types; and
- the three main industry sectors represented are manufacture of fabricated metal products (19 per cent), manufacture of computer, electronic and optical products (14 per cent) and production of machinery and equipment (13 per cent), with the sample covering 17 sectors defined by SIC code.

Operations Directors and Managing Directors represent the two main groups of specific survey respondents, accounting for 38 per cent and 26 per cent respectively. For the senior representatives from 17 of the MSMEs participating in the follow-up interviews, all but two were at the CEO or Director level.

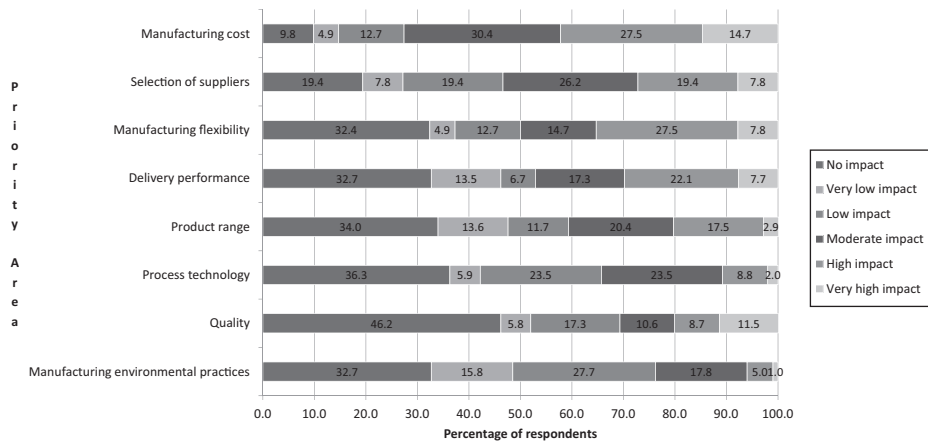
While no claim is being made here about the sample being representative of the MSME population in the UK or a desire to achieve generalisability from the research to be presented, the participant base in both parts of the study are diverse, covering a range of sector attributes, despite the relatively small response rate from what is seen as a challenging sector to engage in such research. A consequence of this is that the study offers both a depth of findings through method of enquiry and potential resonance with the broader MSMEs sector given the participant composition.

### *Recession impact on manufacturing priorities*

The eight key areas of manufacturing priority presented in the paper introduction have been subject to differing levels of recessionary impact as experienced by the surveyed MSMEs; Figure 2 indicates impact level across the deployed six-point scale.

In terms of relatively high impact being experienced, manufacturing costs represents the stand out area for focus and potential recalibration. Here, 42.2 per cent of the surveyed MSMEs suggest that the recession period has resulted in a high or very high impact on cost. To a slightly lesser extent, there has been an equivalent relatively strong influence on manufacturing flexibility (35.3 per cent), delivery performance (29.8 per

**Figure 2. Recession impact –manufacturing priorities**



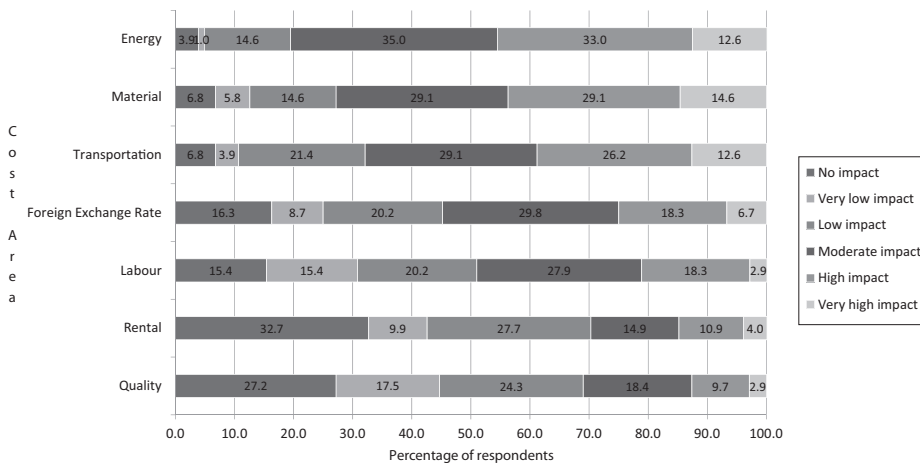
cent) and selection of suppliers (25.2 per cent). A strong level of impact has been less felt with respect to product range and quality, with around one-in-five SMEs reporting this to be at the high or very high impact level, the significance of the recession period impacting strongly on process technology and manufacturing environmental factors is much less so in comparison. The following sections of the study findings will dovetail these headline statistics with reporting from the senior management interviews where the latter will provide a level of context to the changing importance, or otherwise, of these priority areas and the various coping mechanisms or initiatives used by the MSMEs in response.

**Manufacturing costs.** In a broader sense, manufacturing costs have been subject to a relatively high level of impact as a consequence of the Great Recession relative to the other priority areas considered by the MSMEs. The area of cost is multi-faceted, with a number of key contributory areas, each having an associated range of change taking place over the timeframe considered. Figure 3 presents a summary of the impact of the recessionary period on the different aspects of manufacturing cost, again on a six-point scale. The greatest impact of the recession relates to energy costs (45.6 per cent reporting high or very impact), material costs (43.7 per cent) and transportation (38.8 per cent). There are however much less high levels of impact on costs pertaining to rents and quality.

The impact on manufacturing cost shows the strongest and most significant association with that on manufacturing flexibility ( $r = 0.676$ ,  $p = 0.000$ ) and selection of suppliers ( $r = 0.632$ ,  $p = 0.000$ ). These various cost impacts based on various manufacturing priority areas are to a great extent driven by every growing customer demands for more complex product mixes and changes based on volume and delivery requirements, further exacerbated by a contraction of the supplier base. This is reinforced in terms of specific costs, with manufacturing costs also being highly associated with impact changes relating to material ( $r = 0.705$ ,  $p = 0.000$ ) and transportation costs ( $r = 0.608$ ,  $p = 0.000$ ).

The impact of the recession has resulted in energy costs moving much more into the consciousness of senior management within the MSMEs, with comments such as “it’s become a topic of conversation that it was never in the past”. To address these problems,

**Figure 3. Recession impact –specific manufacturing costs**



senior managers interviewed from these MSMEs, incentivised by cost control and reduction, have pointed to the adoption of newer energy efficient manufacturing processes, implementing a differing mix or balance of energy supplies, renegotiation of energy supply contracts and have made significant investment in particular manufacturing environmental practices including automatic lighting and solar roofing cells, with interviewees stressing the consideration of payback period relating to such investments.

Perhaps unsurprisingly, material costs represent the next area of relatively high impact reported in both parts of the primary study. Reduction in stock by suppliers has caused material costs to increase, having an impact on product pricing to the detriment of competitiveness, one MSME interviewee reporting, “so you get a mismatch between costs and price. We’re expensive in the marketplace now”. Various counter strategies have emerged from the interviews including greater efforts being made to recycle, greater application of formal forecasting techniques and supply contract renegotiation. Changes to material cost impact are also strongly associated with those exhibited by manufacturing flexibility ( $r = 0.606$ ,  $p = 0.000$ ), cost of transportation ( $r = 0.641$ ,  $p = 0.000$ ) and energy costs ( $r = 0.684$ ,  $p = 0.000$ ).

Increases in transport costs have been exacerbated for MSMEs by fuel and vehicle insurance increases, as well as by fundamental changes in consumer expectation around order size, frequency and delivery performance (to be described later). There is a reported knock-on effect across the supply chain, for example “suppliers have had to increase their fuel costs and they are passing those on”. Various counter strategies have again emerged and have been reported among these MSMEs, including alternative modes of shipment where possible, particularly for export, greater consideration of more local markets, fuel-efficient vehicle investment and streamlining numbers of contractors used for product transport. These supplier issues have further impact on quality, while logistics costs have informed the development of certain manufacturing environmental practices.

Although it represents a relatively medium level impact compared with other costs, foreign exchange rate influence on manufacturing costs represents an interesting study outcome. There is evidence from the interviews that the external impact of currency behaviour is two-directional. With the Eurozone representing the largest supply base for UK-based MSMEs operating in high-tech industries, the increased value of the British Pound Sterling against the euro from January 2009 resulted in a number of these MSMEs witnessing lower supply costs. For those MSMEs dependent upon commodities such as raw materials, and for those being defined as the more low-tech industries, supply costs have increased primarily due to price inflation, supporting evidence from the interviews including “steel prices have gone through the roof”. Exporting into the Eurozone has proved to be challenging with UK products becoming less price-competitive. Those in the study trading beyond the UK report a mix of good news, challenges relating to competitiveness and profitability and their organisational implementation of various initiatives to protect against currency fluctuation. The latter include greater application of forecasting and hedging techniques as well as negotiating trade contracts from the outset in Sterling.

Three areas of cost exhibiting “no impact” up to “moderate impact” for a majority of the MSMEs are quality, property rental and labour costs. For quality, shorter delivery times and supplier reliability represent two areas for particular consideration and will be discussed below. Where impact is limited for labour costs, location can be an important determinant, given employee supply is in abundance in a significant number of areas of the UK, this is particularly witnessed and supported by representatives from MSMEs in the study located in Northern England. Challenges are evident for MSMEs with high-tech processes that require employees with more substantial skills, for example one senior manager reporting:

[...] we need qualified engineers and recruiting qualified engineers is very difficult [...] in some cases, wage costs have gone up by 20 per cent, our prices haven't gone up to cope with that.

For those operating in the lower-tech arenas, retention challenges relating to less well-rewarded employees are reported, as is the associated effect on increased training costs. In short, both labour demand and skills shortages where labour is relatively more plentiful have impact on labour costs as part of the overall manufacturing costs for the sector. Across the sector initiatives to counter these problems include further investment in automation, pegging salary increases, despite these challenges, and employing more University graduates.

*Selection of suppliers.* Where supplier selection has been witnessed as having an impact across the MSMEs survey, various interviewees from these participating organisations have commented on the contraction of supply chain both in terms of supply sources and diminishing inventory levels. The reduction in available supply sources has been noticeably influenced by various (UK-based) suppliers entering administration during the period of recession. The Great Recession also prompted various suppliers to forecast reductions in demand, consequently reducing their production volumes. As market demand started to grow post-2011, low stock levels held by high-tier suppliers impacted throughout the supply chain, experiences including “because of the economic recession companies tend to tighten their belts and some companies I think tighten their belts too much”. Demand fluctuations have also influenced supply prices and therefore manufacturing costs, with a number of suppliers making increases as a defence against future volatility. Unsurprisingly, these supply pressures have affected MSMEs’ finances, with reports such as:

[...] they're [suppliers] probably more concerned like everybody is about getting their bills paid so they're probably trying to push us into shorter payment periods. This obviously can affect our cash flow.

Moreover, the senior managers have pointed here to an impact on both manufacturing cost and production quality, given greater supplier vulnerability, which has also impacted upon reliability of supplies.

The issues identified have also moved supply chain management to the forefront of MSMEs' decision-making, and the discipline has taken on more of a strategic consideration than that afforded pre-recession. With increasing senior management focus on supply chain operations, many of these MSMEs have reviewed and streamlined their supply chain to concentrate on long-term, sustainable and reliable partners to safeguard against cost and quality, given some of the challenges indicated above. Supply partnership creation has forced a number to locate non-UK suppliers, although this option is the least preferable option for high-tech MSMEs, who value close proximity to their supply chain in the creation of high-quality products. In contrast, MSMEs relying on low-tech commodity supplies have taken on a more globally based supply chain, typically involving partners from emerging economies including China, India and parts of South America as a way of controlling cost. Finally, some of these participating MSMEs have adopted greater vertical integration, witnessed by manufacturing-in-house product components previously outsourced.

*Manufacturing flexibility.* While the survey results presented in Figure 2 suggested that manufacturing flexibility was impacted heavily upon by the recession for a relatively high proportion of MSMEs, it is equally worthy of note that almost one-in-three of these companies have experienced no impact at all. Where tangible impact was experienced, the senior manager interviews have pointed to shifts in market demand towards more frequent and smaller batches, with shorter delivery lead times, coupled with greater market demand for product innovation, differentiation and customisation. In combination, these radical changes in market expectations have impacted significantly on MSMEs manufacturing flexibility. This impact although significant is arguably an indirect one, first, impacting on customer expectations, which in turn, have been passed onto the manufacturer manifesting themselves on flexibility and use of technology, an example being "pre-recession times they might have said, well new product development and all this extra complexity there'll be a price increase but they won't do that now". For MSMEs to meet the need for flexible manufacturing, a number have re-invested in their manufacturing systems and processes, experiences including:

[...] we have a very, very flexible manufacturing system and can do small batches on quite short lead times which our competition can sometimes fail to do but there's a cost associated with that.

Alongside its association with overall manufacturing cost impact, changes in impact relating to manufacturing flexibility also associate strongly with impact on delivery performance ( $r = 0.665$ ,  $p = 0.000$ ) and process technology ( $r = 0.656$ ,  $p = 0.000$ ), perhaps as expected given the outcomes and responses reported.

Delivery performance. In a similar way to manufacturing flexibility, the survey response on the recession impact on delivery performance suggested about a third of the participating MSMEs have witnessed limited impact, with a similar proportion, as presented in Figure 2, witnessing high to very high impact in this aspect of their manufacturing decision-making. The changes to delivery performance also correlate strongly with those involving quality ( $r = 0.739$ ,  $p = 0.000$ ), changes in product range ( $r = 0.619$ ,  $p = 0.000$ ) and labour costs ( $r = 0.528$ ,  $p = 0.000$ ).

Subsequent probing in the interviews suggests that irrespective of the impact of economic turbulence on these MSMEs and their ability to provide high levels of delivery performance, this manufacturing priority is still afforded a high level of sectoral priority. The external dynamics for the sector were reported in these interviews to have changed considerably with some MSMEs losing orders because they cannot meet more demanding delivery deadlines, with customer expectations and associated pressure being put on the ever increasing MSMEs. As indicated above, the turbulent economic environment has led to a significant change in customer demand towards more frequent and smaller batches, coupled with shorter delivery times, and this increased product complexity impacting directly on delivery performance. Where the MSMEs' output is high-tech and bespoke, these demand changes were reported by the senior staff as being particularly problematic, especially with respect to lead times. A consequence of this is significant investment across the sector including redesign of the manufacturing system, movement towards manufacturing-in-house and product price reduction to ensure greater competitiveness and market responsiveness. A number of the MSMEs have introduced concurrent engineering, with higher integration of business functions including marketing, product design and manufacturing, thereby ensuring customer service efficiency. In turn, this has led to reduced manufacturing lead-times and associated delivery times. Finally, greater cooperation with suppliers to ensure raw materials meet quality specifications has been pursued, alongside meeting ever more challenging aspects associated with time.

*Product range.* Similar to delivery performance, the modal response relating to product range is that the economic environment has had no impact for more than a third of the MSMEs in this study. In contrast, over 40 per cent of the MSMEs have had to adjust their product range in response to market conditions, indicated here by moderate-to-very-high impact, although the latter is less here than for other priority areas of manufacturing.

Where high levels of recession impact have been experienced, the interviewees suggest that product ranges have expanded due to increased market opportunities being realised overseas or from the force of domestic competition, leading to an upturn in their innovation and, in turn, product complexity. There is a body of expertise across a number of UK-based MSMEs in the area of high-tech products and manufacturing processes, who have been captured in this study and have given witness to increases in demand for their know-how by businesses located in emerging economies requiring consultancy services, thereby contributing further *servitisation* to the external market. Concurrently, overseas competition is catching up with UK manufacturing, and MSMEs in particular have needed to move relatively quickly for a product differentiation strategy. Various senior managers interviewed in this study have suggested their MSMEs have adopted product R&D strategies in relation to market demand, leading to the provision of more complex solutions to their customers, for example "we're not just a processor of materials, we're actually designers and that's a big, big difference". Control over product pricing has also been signposted as an outcome of this changing

business environment, with various MSME leaders appreciating stable prices for their products, and they have subsequently started to monitor their cost base more closely to avoid price inflation.

*Process technology.* Perhaps in line with the maturity of the participating MSMEs in this study, 36.3 per cent of the respondents suggested that the recession had no impact regarding process technology within their MSME, with low-to-moderate impact being the most common response in combination, accounting for 47.0 per cent of the participants. The senior manager interviews confirm that these MSMEs have maintained comparable levels of investment in process technology regardless of the turbulent external environment. Various interviewees suggest that the MSMEs regard constant investment into their process technology as a strategy to support manufacturing flexibility with respect to both product differentiation and delivery performance. Both of these outcomes have been highlighted in the study findings presented here as crucial important for UK-based MSMEs in the maintenance of a customer base and the pursuit of additional market opportunities, therefore reinforcing further the impact of the external market place and fluidity in customer demands on this manufacturing priority. A number of examples of investment in process technology include investment in automation, investment in knowledge: “we started on a KTP [knowledge transfer partnership] with a University” and concurrent engineering and quality control. Investment in process technology correlates strongly with those in manufacturing flexibility ( $r = 0.656$ ,  $p = 0.000$ ), with both ultimately being driven by a more demanding customer base.

*Quality.* The MSMEs survey, as indicated within Figure 2, presents a broad range of quality-related experiences relating to the period of recession, with 46.2 per cent indicating the recession had no impact at all on quality's role as a manufacturing priority, with Regarding quality, 23.1 per cent of the MSMEs reporting low to very low impact due to recessionary forces, with a final 30.8 per cent suggesting at least a moderate impact or greater.

Reaction to the Great Recession emerged from various interviews, particularly where the delivery of a more sophisticated product range has resulted in quality maintenance being more difficult to achieve compared with the pre-recession era. Experiences mentioned from the interviewees include “they have extra complexity [products] which means it's higher risk”. Three of the 17 interviewed MSMEs have witnessed a decline in quality standards among their suppliers, which in turn, has impact both on their products and associated quality-related costs:

[...] we've also experienced lots of quality issues as well because maybe some of the experienced staff of these companies have gone” and “people sell you things that don't quite work don't quite do what they're supposed to do, and we end up having to put it right, that's a massive cost, impact to us being two of the experiences illustrated.

In such cases, significant reviews have taken place within the MSMEs of the supply base, consistent with both survey and senior management reporting of supply chain management taking on more of a strategic focus as indicated above, with quality costs being an impact in certain cases, although in relative terms a more robust cost area in terms of recession impact as presented in Figure 3. Given the longevity of business for the participating MSMEs in this study, perhaps the maturity of their quality practices, systems and management have made this area one, relatively, less subject to impact



during the recession. Recessionary impact, however, does link with impact exhibited elsewhere, particularly with respect to manufacturing flexibility ( $r = 0.610$ ,  $p = 0.000$ ), supplier selection ( $r = 0.568$ ,  $p = 0.000$ ) and not surprisingly cost of quality ( $r = 0.584$ ,  $p = 0.000$ ), the latter two connecting through a recent history of supplier vulnerability and reliability.

*Manufacturing environmental practices.* Despite some of the green or environmentally supportive initiatives reported from the interviews with senior MSME representatives, only 6.0 per cent of those involved in the survey have suggested the period of recession has had a high or very impact on changes in this aspect of their business. More than three quarters of the surveyed SMEs suggest a low level of impact at most.

This low impact of the external economic environment on the introduction or step-up in manufacturing environmental practices by these MSMEs is further explained by the supporting senior manager interviews. While recognition of their importance is established, so are associated cost and risk barriers as inhibitors. Where MSMEs have pointed to low manufacturing energy usage, they have also labelled themselves as having a low impact on greenhouse emissions. The decision to invest into greener manufacturing has been driven for some by customer or market pressure, for example “customers expect certain things, they want a sustainable supply chain” and “it’s customer driven because they score you, and part of the score you get is based on your environmental so that is a high impact on you”, while more generally to control costs or through cost incentive. Examples of specific manufacturing interventions include automated lighting, electricity generating solar panels and searching for alternative manufacturing energy sources, which are all driven by challenging energy costs, as well as greater implementation of recycling policies or seeking income-generating markets for waste by-products or supply packaging, for example:

[...] we are much more aware, so we are recycling a lot more than we did back in 2008. But there is a benefit. At the end of the day because we’re doing all that we’re not paying the same landfill costs. So there is a benefit to it to be fair, it’s not just a good thing to do it’s actually a cost effective thing to do.

These different initiatives support the assertion of the links between environmental consciousness and cost control through dimensions of cost relating to energy, materials and logistics. Initiatives realised in this area of the business have also impacted strongly on changes in quality costs ( $r = 0.578$ ,  $p = 0.000$ ), which perhaps are driven by compliance, investment expenditure or inevitable defects based on new systems implementation.

## **Conclusions and implications**

Manufacturing cost impact is uppermost in most MSMEs than any other current strategic issue. The volatile nature of the UK currency has afforded mixed sector outcomes, with exchange rate proving important, alongside a sector-wide inability to position itself beneficially to realise competitive advantage (Oxford Economics, 2009). Advice relating to currency hedging and using stable currency to pay for fixed supply contracts has been heeded (ICAEW, 2012). Increases in material costs have proven to be challenging, driven by inflation in raw material prices during the recessionary timeframe (ONS, 2008, 2009, 2010, 2011, 2012b). These challenges have been made even more difficult by lower stock availability within the supply chain. Transport costs have

been affected primarily by fuel, with tier-two and tier-three SMEs having most difficulty. Many MSMEs have a geographically dispersed supply chain; others are heavily dependent upon an ability to export (ICAEW, 2012). Transportation costs are further raised by changes in customer requirement around smaller and more frequent product orders. Energy costs have taken on strategic priority within this sector with above inflation increases to gas and electricity prices (DECC, 2014). Updates to factory infrastructure through the deployment of automation and IT have further added to costs here, although the strategic considerations afforded have made organisations to consider efficient usage, thus paving the way for future savings (Carbon Trust, 2012). The shortage of appropriately skilled employees has proved challenging both from recruitment and cost perspectives due to competing companies. Lower skilled employees have added additional cost pressures through churn and necessity for development. Salary costs experienced by some of the MSMEs also appear at odds with figures reported nationally, where typically increases were sub-inflation (BBC, 2012).

Post-recession, MSMEs have faced the dual challenge of diminution in supply quality and increasing customer demands, demonstrated by product complexity and demands for shorter delivery times. MSMEs have been experiencing poor quality supplies resulting in increased warranty costs and poor delivery performance (Grössler and Grübner, 2006). This has led to the strategic evaluation of their supply chain, resulting in various initiatives such as investing in vertically integrated manufacturing processes to support in-house manufacturing as an alternative to inferior external supply, potentially raising short-term costs. The necessity to establish long-term, close relationships with an emphasis on sharing and collaboration is proposed by MacBryde *et al.* (2013) as essential for SME practice in the foreseeable future for those involved in high-value activities. In addition, MSMEs have invested in communicating supply quality issues to shop floor operators and managers with visual messaging methods such as staff presentations and company newsletters. Indeed, Oakland (2003) promotes visual communication as the most effective method of engaging, informing and training production staff in quality improvement initiatives. Such methods allow for early detection of poor quality within the manufacturing process and ultimately lead to a reduction of lead times and improved delivery performance (Harrison and van Hoek, 2011).

A dual challenge is presented to these MSMEs around manufacturing flexibility, with potential conflict between smaller batch and shortened lead-time demand and the resultant upturn in delivery frequency. This is exacerbated by customer expectations around greater product differentiation and customisation, thereby demonstrating the impact of ambiguity in product customisation on increased flexibility in manufacturing (Gerwin, 1987). Flexibility is beneficial in uncertain times, with better performing organisations being more likely to excel (Grewal and Tansuhaj, 2001). Financial challenges do emerge here where profits can be squeezed, as the benefits of economies of scale are eroded, while the specialist and niche provision afforded by these MSMEs coupled with market demand around batch sizes, lead times and order frequency is a source for potential conflict for those who have invested in processes that encompass significant automation (Schroeder *et al.*, 2002).

The study confirms industry reports (CBI, 2010; BIS, 2012) which highlight the increasing awareness and pressure by market forces on UK manufacturers. Wilson (2011) further supports this, pointing to the growing awareness of consumers of the environmental impact of consumption, which has placed an increasing pressure on manufacturers to consider their carbon footprint. Although Wilson (2011) mainly refers to business-to-consumer (B2C) relationships, for the majority of MSMEs participating in this study which operate in a business-to-business (B2B) trade relationship, the coercive pressure is passed on through the supply chain from higher-tier suppliers to their lower-tier suppliers where typically MSMEs are located. Potentially, this may result from B2B customers demanding to apply life-cycle assessment on their products as part of their sustainability (environmental) agenda.

The position of delivery performance as a crucial manufacturing priority is accepted (Grössler and Grübner, 2006), and the message from this study is that its importance is not driven solely by economic conditions. Delivery performance here is an “order qualifier” (Hill, 2009) rather than an organisational achievement that affords competitive advantage. The findings concur with the recent study by MacBryde *et al.* (2013) on the strategic move towards high-value manufacturing by Scottish MSMEs. This sector-wide movement towards excellence in delivery performance representing typical attainment is recognised nationally (DTI, 2008), dovetailing this with high-level quality, and marks out many of the MSMEs as “speedy conformers” or “niche differentiators” (Kathuria, 2000).

In conclusion, as a result of the turbulence and volatility caused by the Great Recession within the UK and other advanced economies, eight manufacturing priorities have emerged from this study coupled with the corresponding strategic options that have been pursued by MSMEs: product range, manufacturing flexibility, process technology, supply chain management, quality, delivery performance, manufacturing cost and environmental practices (green manufacturing). Building on the construct of “innovators” (Li, 2000) attached to the UK-based MSMEs, this study also identifies that innovation in product design and manufacture (confirmed by R&D investment) has allowed the sector to stay competitive and meet its market expectations for growing product complexity and customisation. The study extends the recent work of Kitching *et al.* (2009a, 2009b) which found similar counter-recession strategies adopted by the overall UK-wide private sector, with this study strongly confirming that the MSMEs sector has followed an ambidextrous strategy as described by Rumelt (2009) and Williamson and Zeng (2009).

### **Contribution to knowledge**

The study has shown that each of the eight manufacturing priorities (product range, manufacturing flexibility, process technology, supply chain management, quality, delivery performance, manufacturing cost and environmental practices) have been influenced or been subject to change as a consequence of the Great Recession within the participating MSMEs. There is a level of inter-relationship between these priority areas (as indicated by the correlation analysis and the qualitative reporting of numerous MSME responses and interventions in the paper's study findings), leading to various areas of impact, many of which have been driven by changes to attributes associated with the external business environment that the MSMEs find themselves operating since 2008. These external drivers include market-determined costs relating to energy, transportation and labour, the availability of finance for investment and the fluid behaviour and expectations of both the market and suppliers.

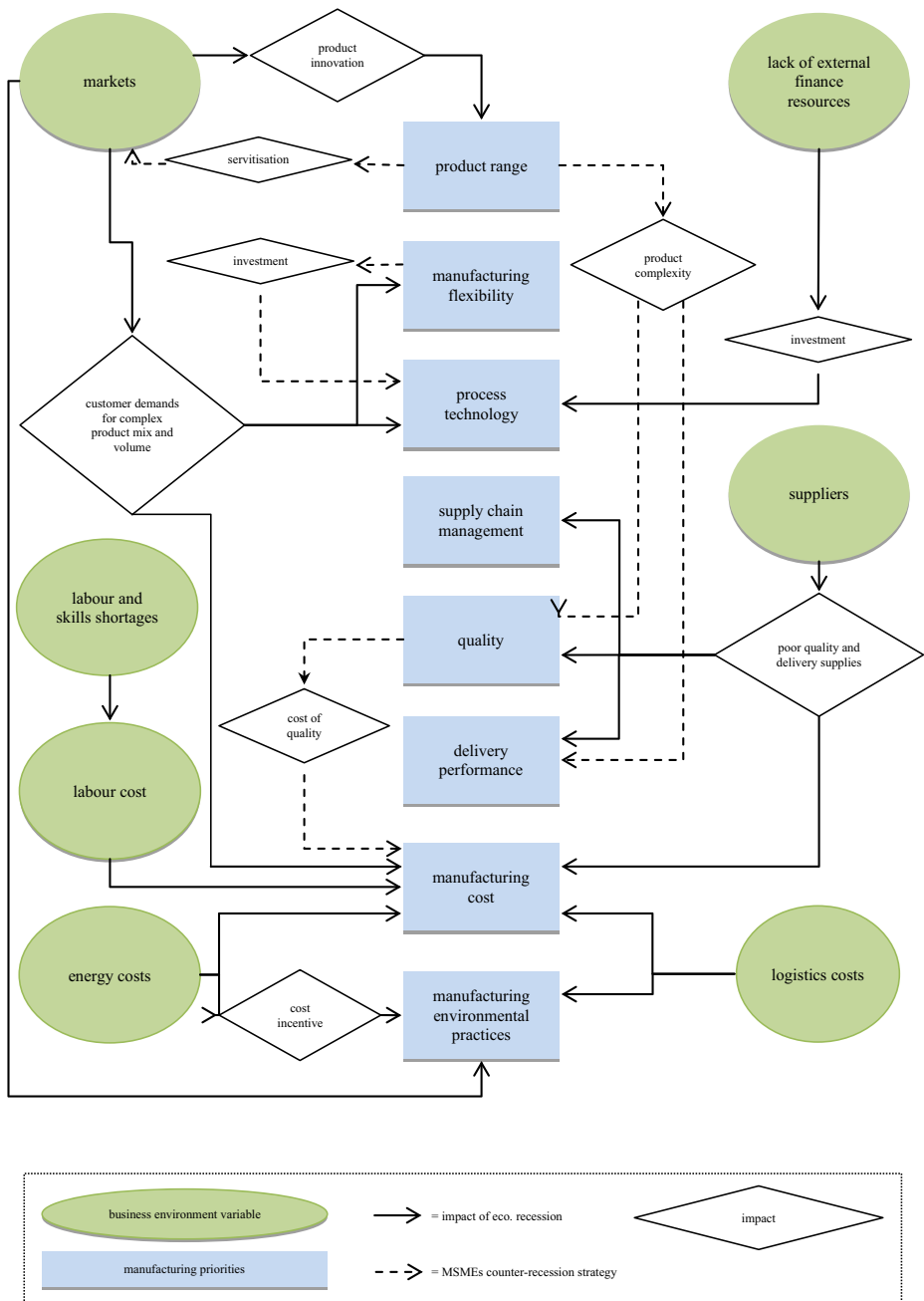
Data from the study demonstrate the counter-recession strategies MSMEs have implemented by not only investing in their product range (manufacturing flexibility and technology) but also seeking additional income-generating streams by offering their manufacturing expertise as a consultancy service to the emerging markets of China and South America (servitisation), and by strategically reviewing their supply base to ensure quality (in-house manufacturing), and associated manufacturing cost are optimal and support a sustainable business.

Based on the evaluation and discussion of the study findings presented within this paper, Figure 4 presents the relationship between these various components of the decision-making process.

Times of economic turbulence and volatility can be particularly challenging for the SMEs sector and can initiate radical strategic responses. This has been witnessed during and since the Great Recession with high levels of turbulence and volatility at macro- and micro-economic levels (Pearce and Michael, 2006; Deans *et al.*, 2009; Kitching *et al.*, 2009a; Smallbone *et al.*, 2012; MacBryde *et al.*, 2013; Soininen *et al.*, 2012). The main contribution of this study is a deliberate departure from a narrow focus on sectoral financial constraints initiated by the volatile business environment, which has provided emphasis for much of the earlier related work. The alternative focus provided by this study is taking lessons from the work cited above and extending focus to incorporate the impact of broader industry and market pressures, and by doing so, giving account of the sector's changes to manufacturing priorities and related decisions. This study responds to suggestions made for further qualitative-based research to be undertaken in the field of manufacturing management (Boyer and Swink, 2008; Barratt *et al.*, 2011), through its inclusion of qualitative analysis as part of a mixed methods research approach in the assessment of manufacturing strategy and various associated issues in UK MSMEs.

In addition to the financial restrictions placed on the sector which are highlighted extensively, this study can report that since the Great Recession of 2008, the UK-based MSMEs are experiencing a step-change in customer expectations around increased, more complex and bespoke product mix that have required MSMEs to invest in both product innovation (Beaver and Prince, 2002) and manufacturing flexibility (Oke, 2005; Rundh, 2011), as highlighted within Figure 4. Essential to successful dovetailing of these two strategic decisions is appropriate movement in organisational culture and management philosophy including the deployment of greater cross-functional decision-making processes. This study further contributes to existing and developing theory relating to concurrent engineering (Pullan *et al.*, 2010; Schroeder *et al.*, 2011), by extending its application to MSMEs operating against a more challenging environmental backdrop. This study contributes by reporting on MSMEs initiatives relating to socially responsible manufacture through its assessment of the adoption of manufacturing environmental practices (Deif, 2011). The outcomes stress the importance of market-driven and cost-driven incentives, the former being particularly relevant to MSMEs operating within a business-to-business (B2B) supply chain who are experiencing pressures from their higher-tier suppliers and the latter more generally across a sector witnessing ongoing above-inflation increases in their manufacturing energy costs. Recent research by Neely (2008) has reported on the phenomenon of servitisation within the manufacturing sector, which has been verified as part of this work for UK MSMEs seeking further opportunities within the emerging markets as consultancy providers.

Figure 4. Impact on MSMEs manufacturing priorities as a consequence of the Great Recession (2008)



## **Contribution to practice**

This study has also highlighted a number of practical implications for business managers in the UK MSMEs sector. The study offers an insight for MSMEs' senior managers on how the sector has experienced and strategically positioned itself against the turbulence and volatility of the business environment which is still developing as a result of the Great Recession of the UK and other national economies. This strategic positioning and the levels of complexity within the associated decision-making process are illustrated in Figure 4, which highlights the range of external factors influencing the organisation and its potential strategic response. It demonstrates to senior management within MSMEs that an individual manufacturing priority cannot be assessed in isolation, and the appropriate strategic responses are influenced by various common external factors. Figure 4 therefore acts as a guide to practitioners on both manufacturing strategy content and context.

Given the structural similarities and common recessionary experience between the UK and other advanced economies and in particular the G7 nations of Canada, France, Germany, Italy, Japan, the UK and the USA (Jorgenson and Vu, 2013), the results of the study presented here are applicable to MSMEs and relevant to their managers located in these nations.

## **Recommendations for further research**

The study presented provides a broad consideration on the redefinition and reconfiguration of manufacturing priorities that MSMEs have been faced with in recent times. A number of interesting findings have emerged, as have particular areas for further, more in-depth consideration.

Manufacturers based in developed economies (G7) are increasingly faced with competition from the emerging low-cost economies and as such as have been urged by government policies, industry analysts and academics to reposition themselves and move towards high-value manufacturing (BERR, 2008; MacBryde *et al.*, 2013). Drawing lessons from the study presented in this paper and to support the repositioning of UK and other G7-based manufacturers as high-value manufacturers, the strategic role of supply chain management requires further investigation. In more detail, this relates to the ongoing performance and costing issues of suppliers and the impact of these on MSMEs product mix, quality, delivery performance and manufacturing cost optimisation. Results from the study suggest the management of the supply chain has started to migrate towards a more strategic area of decision-making within UK-based MSMEs, this is an encouraging development. Connected to this assessment is the nature of focus and sustainability in supply chain relationship building, the differing roles of insourcing and outsourcing, the role of quality assessment in the performance management of the supplier relationships and the roles such partnerships play within a concurrent engineering management philosophy. Associated with the above is the increasingly sophisticated B2B marketplace, with its growing demands on product complexity, delivery volumes and performance, all of which merit further examination, particularly given their significant impact on a number of the manufacturing priorities examined within this study. Implicit to the examination of the supply chain and associated relationships internal and external to the MSMEs is the further consideration of the impact of any changes and developments to manufacturing costs, given the dominant role they have played in the changes experienced by this sector since the Great Recession.

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### **Further reading**

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